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PLANT PROTECTION BULLETIN

A PUBLICATION OF THE WORLD REPORTING SERVICE ON PLANT DISEASES AND PESTS

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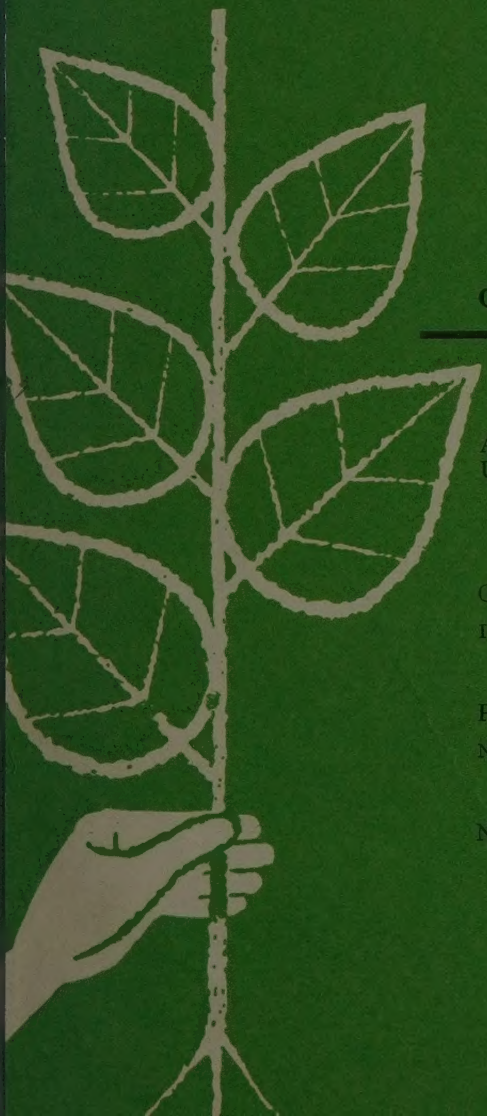

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FAO PLANT PROTECTION BULLETIN

A PUBLICATION OF THE WORLD REPORTING SERVICE ON PLANT DISEASES AND PESTS

A Status Report on Forest Insect Conditions in the United States in 1959[1]

J.W. Bongberg and W.H. Bennett, Division of Forest Insect Research, Forest Service, United States Department of Agriculture

General summary

Forest insects caused severe damage and loss to forest trees in all sections of the United States during 1959. Bark beetles, as a group, were more destructive than other species, but outbreaks of budworms, loopers, tussock moths, sawflies, spittlebugs, aphids and others also were damaging in many areas.

Alaska

A recurrence of black-headed budworm, *Acleris variana* (Fern.), and hemlock sawfly, *Neodiprion tsugae* Midd., infestations in southeast Alaska, pose a new threat to the hemlock-spruce stands in that area. The Alaska spruce beetle, *Dendroctonus borealis* Hopk., became epidemic on part of the Kenai Peninsula and caused heavy loss of white spruce and Lutz spruce. The spear-marked black moth, *Eulype hastata* L., defoliated considerably less forest in 1959 than in the widespread epidemic of 1958, and populations dropped to low levels in all areas.

Oregon and Washington

Defoliation by the spruce budworm, *Choristoneura fumiferana* (Clem.), declined in Washington and in all but the southern portion of Oregon. A decline also occurred in infestations by the Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopk., in southern Oregon but remained static in southwestern Washington. The western pine beetle, *D. brevicomis* Lec., was epidemic in portions of both states and the mountain pine beetle, *D. monticolae* Hopk., was destructive in pole-size ponderosa pine in southern Oregon. Tree-killing by the balsam woolly aphid, *Chermes piceae* (Ratz), decreased for the second successive year, but populations increased in some areas, indicating a recurrence of heavier damage in the future. The European pine shoot moth, *Rhyacionia buoliana* (Schiff.), was discovered for the first time on ornamental pines in the vicinity of Seattle, Washington.

California

Timber losses caused by several species of bark beetles, *Dendroctonus* spp. and *Ips* spp., in California, were the highest of any year in the past decade. The western pine beetle, *D. brevicomis*, developed many serious outbreaks across the state; the mountain pine

[1]This report is a compilation of material submitted by the forest and range experiment stations of the Forest Service, United States Department of Agriculture. The information was obtained from Forest Service aerial and ground surveys, which were supplemented by reports from federal, state, county, and private agencies, and many individuals.

beetle, *D. monticolae*, was numerous and caused widespread losses in sugar, lodgepole and ponderosa pine at many locations. The Jeffrey pine beetle, *D. jeffreyi* Hopk., showed signs of increasing in several parts of the state, and engraver beetles, both *Ips* spp. and *Scolytus* spp., were damaging to pines and firs in many places. Epidemic infestations of the lodgepole needle miner, *Recurvaria milleri* Busck, continued in the high-elevation stands of lodgepole pine at Yosemite National Park, and widespread infestations of the black pine leaf scale, *Nuculaspis californica* (Coleman), developed in stands of sugar pine at several places in the state. An incipient outbreak of the pandora moth, *Coloradia pandora* Blake, was discovered in San Diego County — the first in the state for several years.

Montana, Idaho, Utah and Nevada

Serious infestations of mountain pine beetle *Dendroctonus monticolae*, and of Engelmann spruce beetle, *D. engelmanni* Hopk., continued in stands of lodgepole pine and Engelmann spruce at several locations, principally in Utah but also in portions of Idaho and Montana. Defoliator infestations also continued in severe proportions in Idaho and Montana ; spruce budworm, *Choristoneura fumiferana*, occurred on approximately 4 million acres of spruce-fir timber, and the lodgepole needle miner, *Recurvaria milleri*, was in outbreak status on 104,000 acres. A new epidemic of pandora moth, *Coloradia pandora*, ranged across 15,000 acres of lodgepole pine forests in the Uinta Mountains of Utah : the larch casebearer, *Coleophora laricella* (Hbn.), extended its range to 8,000 square miles in northern Idaho, and one or more species of tussock moths, *Hemerocampa* spp., were found in outbreak proportions in Idaho and Nevada.

Wyoming, Colorado, Arizona, New Mexico and Plains States

Bark beetles and tree defoliators were destructive to forest trees throughout the central and southern Rocky Mountains and Black Hills beetle, *Dendroctonus ponderosae* Hopk., continued in outbreak status in the Black Hills of South Dakota. Douglas-fir tussock moth, *Hemerocampa pseudotsugata* McD., was controlled at four locations in New Mexico and Arizona but infestations of spruce budworm, *Choristoneura fumiferana*, which were not controlled, spread throughout much of the susceptible host type in southern Colorado, northern New Mexico and Arizona. An outbreak of pandora moth, *Coloradia pandora*, occurred over approximately 9,000 acres in stands of lodgepole pine near the Wyoming-Colorado boundary.

Lake States and Central States

Tree defoliators were the principal pests in the Lake States and Central States but pine weevils, shoot and tip moths and spittlebugs were also important in many places. The spruce budworm, *Choristoneura fumiferana*, defoliated increasingly more trees over a wider area in Minnesota, and the jack pine budworm, *C. pinus* Free., severely defoliated its host in many areas in Wisconsin, Michigan and Minnesota. Defoliation by larch sawfly, *Pristiphora erichsonii* (Htg.), was general on about 350,000 acres in Minnesota and infestations increased in severity in northern Wisconsin and in Upper Michigan. Pine sawflies, *Diprion* spp. and *Neodiprion* spp., damaged natural pine stands and plantations in all states ; pine tip moths, *Recurvaria* spp., were also damaging in many areas. European pine shoot moth, *Rhyacionia buoliana*, caused great damage to young pine plantations in Lower Michigan and in several localities in Wisconsin. The Saratoga spittlebug, *Aphrophora saratogensis* (Fitch), caused especially severe damage in Wisconsin ; the pine spittlebug, *A. parallela* (Say), was destructive in areas planted to Scotch pine in each of the Lake States.

Southern and Southeastern States

Several important insects were destructive to forest trees in the southern and southeastern United States in 1959. A severe outbreak of southern pine beetle, *Dendroctonus frontalis* Zimm., extending over 70,000 acres, developed

in southeast Texas, and spot infestations occurred in portions of North and South Carolina and in Alabama. The black turpentine beetle, *D. terebrans* (Oliv.), was also destructive, particularly in flatwoods forests, along creek bottoms, and on low poorly-drained sites in the Gulf States. Ips beetles were less abundant than for the past several years, yet *Ips avulsus* Eichh., developing in logging slash or in trees uprooted and broken by high winds, spread to standing trees in many areas. A little-known sawfly, *Neodiprion excitans* Roh., stripped foliage from loblolly and shortleaf pines over some 25,000 acres in southeast Texas; the Virginia pine sawfly, *N. pratti pratti* (Dyar), intensified defoliation activity in central Virginia and northeastern North Carolina and spread southward. The red-headed pine sawfly, *N. lecontei* (Fitch), was prevalent in Louisiana, Texas, Oklahoma, Arkansas, Alabama and Mississippi. Infestations of elm spanworm, *Ennomos subsignarius* (Hbn.), increased in scope in the mountains of Georgia, Tennessee and North Carolina. The intensity of defoliation, however, dropped from that of prior years. Balsam woolly aphid, *Chermes piceae*, continued in outbreak in stands of Fraser fir in North Carolina, and a short-lived epidemic of spider mites, *Oligonychus milleri* (McG.), infested about 10 million acres of pines in northern Louisiana and in southern Arkansas.

New England States and the Northeast

The forests of New England and elsewhere in the Northeast were damaged by a number of insect pests, including budworms, weevils, shoot and tip moths, tent caterpillars, sawflies and others. The scope and severity of infestations of the spruce budworm, *Choristoneura fumiferana*, increased in Maine, with 250,000 acres of continuous defoliation in Aroostook County. The forest tent caterpillar, *Malacosoma disstria* Hbn., was more conspicuous and widespread than in prior years, and several species of pine sawflies, *Neodiprion* spp., were numerous and damaging. The European pine shoot moth, *Rhyacionia buoliana*, continued to damage valuable plantings of red and Scotch pines in the western two thirds of the Northeastern States, and *R. frustrana* (Comst.) severely attacked loblolly pine in plantations in Maryland and at other locations. The white pine weevil, *Pissodes strobi* (Peck), was abundant in many of the Northeastern States but was particularly damaging in New Hampshire, New York and Pennsylvania. The balsam woolly aphid, *Chermes piceae*, continued as a major pest of balsam fir in Vermont, New Hampshire, New York and Maine.

Status report on insect pests

Pine bark beetles

Western pine beetle, *Dendroctonus brevicomis*. This important forest insect caused serious losses of ponderosa pine in portions of Washington, particularly on the Gifford Pinchot National Forest and the Yakima Indian Reservation. One of the worst outbreaks in recent years also occurred in portions of California, and tree-killing of serious proportions was common on the Sierra and Lassen National Forests. The insect was more abundant in parts of Montana and Idaho than during the past few years but losses were not severe. In many places, particularly in California, outbreaks occurred in the vicinity of areas damaged by fires, where beetle broods developed in scorched trees. Warm, dry weather during winter and early spring also favored beetle broods in some areas.

Southwestern pine beetle, *Dendroctonus barberi* Hopk. This bark beetle and its associates, *D. convexifrons* Hopk. and *D. parallelocollis* Chap., caused less damage to stands of ponderosa pine in New Mexico, Arizona and Nevada than in the past several years. Concentrations of populations and resultant tree-killing occurred only on part of the Lincoln National Forest in New Mexico and in portions of the San Carlos Indian Reservation in Arizona.

Mountain pine beetle, *Dendroctonus monticolae*. This serious enemy of the important pine species in the Western States was destructive in many areas. Losses in sugar pine stands

in California were the highest in many years. In northern Idaho and western Montana, serious losses occurred in old-growth western white-pine. Beetle populations remained heavy or increased in ponderosa and lodgepole pines in portions of Oregon and Washington. Previous outbreaks in stands of lodgepole pine, in California, Utah and Wyoming expanded, and new ones appeared, despite major efforts to reduce the rate of tree-killing in all seriously affected areas. Several serious infestations occurred in stands of second-growth ponderosa pine ; one at the north end of Lake Tahoe in Nevada ; another on a portion of the Boise National Forest in Idaho ; a third on the Fremont National Forest in Oregon ; and several others in both Oregon and Washington. In these latter outbreaks, stands presumably have been weakened by overstocking and by competition from other tree species.

Black Hills beetle, *Dendroctonus ponderosae*. The Black Hills beetle increased several fold in the ponderosa pine type in much of the Bighorn Mountains of Wyoming and along the Front Range of the Rocky Mountains in Colorado. Infestations remained static in the Black Hills of South Dakota and declined in northern New Mexico. The beetle was found attacking limber pine in central New Mexico during the year — a new southern location. Longstanding outbreaks in southern Utah were much reduced by control work.

Jeffrey pine beetle, *Dendroctonus jeffreyi*. Outbreaks of this major bark beetle were serious at several locations in California. Tree-killing was severe on some 100,000 acres on the Sequoia National Forest ; smaller infestations occurred east of the Sierra Nevada Mountains in Mono County ; at Lassen Volcanic National Park, Lassen County ; and in four counties in the southern part of the state.

Southern pine beetle, *Dendroctonus frontalis*. The southern pine beetle developed in outbreak numbers over some 70,000 acres in southeast Texas and increased activity was reported in several counties in North Carolina. Small spot infestations also occurred on the Talladega National Forest in Alabama and on and near the Sumter National Forest in South Carolina. The explosive nature of outbreaks in all areas prompted public and private agencies to accelerate programs for control and many infestations were thus contained.

Black turpentine beetle, *Dendroctonus terebrans*. The black turpentine beetle has been especially prevalent in the Southern and Southeastern States in recent years in stands weakened by flooding, mechanized logging and other disturbances. During 1959, it was a continuing problem in the Gulf States and was most active in flatwoods forests, along creek bottoms, and on low, poorly drained sites. Logging on wet soils often resulted in excessive injury to tree roots and this damage, plus prolonged summer flooding, created favorable conditions for beetle development.

Fir and spruce bark beetles

Douglas-fir beetle, *Dendroctonus pseudotsugae*. This major pest of Douglas-fir was reduced from levels of prior years in the Western States. The intensity of tree-killing was much less throughout northwestern California and in all of the coastal forests of Oregon. Beetles attacked trees toppled by wind in 1958 over a wide area in southwestern Washington, and killing of green standing trees there may occur in 1960. Beetle activity also declined in most areas in Colorado and no tree-killing of significant proportions was reported elsewhere in the Rocky Mountains. Scattered infestations remained in some places in New Mexico and Arizona ; in the South Bighorn Mountains in Wyoming ; on the Dixie National Forest in southern Utah ; and spot losses occurred at a few locations in Oregon.

Engelmann spruce beetle, *Dendroctonus engelmanni* Hopk. Outbreaks of the Engelmann spruce beetle developed in several of the Western States. In Colorado most infestations were associated with logging operations, where beetles developed in cull logs and serious tree-killing was reported on four of the national forests in the southern part of the state. Severe infes-

tations occurred on the Bridger National Forest in Wyoming; on five of the national forests in Utah; and vestiges of older infestations remained in north Idaho and Montana. In New Mexico, the beetle was reported in outbreak in only one area, near Chama.

ALASKA SPRUCE BEETLE, *Dendroctonus borealis*. The Alaska spruce beetle caused heavy loss of white spruce and Lutz spruce on parts of the Kenai Peninsula in Alaska. Several thousand trees were attacked and killed in the northeastern part of the Kenai National Moose Range and within several drainages of the adjacent Chugach National Forest.

PINE AND FIR ENGRAVERS

Several species of pine and fir engravers were destructive to forest trees in many sections of the country. The Oregon pine engraver, *Ips oregonis* (Eichh.), and the California five-spined engraver, *I. confusus* Lec., were active throughout California, top-killing mature pines in many areas and killing smaller trees. *I. oregonis* increased materially in Montana, north Idaho, Oregon and Washington, but pines on the Wallowa-Whitman National Forest in Oregon were hardest hit. In New Mexico and parts of Arizona, *I. ponderosae* Sw. was important because its attack in the top section of trees often led to attack and tree-killing by associated *Dendroctonus* beetles. The three species of pine engravers, *I. avulsus*, *I. grandicollis* Eichh. and *I. calligraphus* Germ., quite often destructive in the Southern and Southeastern States, were less abundant than for the past several years. In Alaska, near the Gerstle River and along the Alaska highway, several thousand young white spruce were killed by *I. interpunctus* (Eichh.). In this area, large beetle populations presumably developed in logging slash and then attacked and killed the trees. *I. pini* (Say) increased in numbers throughout western New York.

FIR ENGRAVER, *Scolytus ventralis* Lec. Outbreaks of the fir engraver were more extensive in many of the Western States than in prior years. Tree-killing was severe in parts of Oregon, throughout much of California, particularly Placer and Tulare Counties, and in the Wheeler Peak area in Nevada. Increased losses also occurred on the Lincoln National Forest and the Mescalero Indian Reservation in New Mexico.

DOUGLAS-FIR ENGRAVER, *Scolytus unispinosus* Lec. Local centers of tree-killing by the Douglas-fir engraver increased in drought-weakened young stands on the Mt. Hood National Forest in Oregon. Activity of the beetle was also common in the north coastal counties of California.

SILVER FIR ENGRAVERS, *Pseudohylesinus granulatus* (Lec.) and *P. grandis* Sw. Light outbreaks of silver fir beetles increased for the second year on and near the Mt. Baker National Forest in Washington.

EUROPEAN ELM BARK BEETLE, *Scolytus multistriatus* (Marsh.). Populations of this vector of Dutch elm disease were high in the Central States and diseased elms were a common sight in Ohio.

WEEVILS AND WOOD BORERS

PINE REPRODUCTION WEEVIL, *Cylindrocopturus eatoni* Buch. The pine reproduction weevil was sufficiently destructive to young pine plantations in parts of California to require suppression. It was not reported in abundance elsewhere.

ENGELMANN SPRUCE WEEVIL, *Pissodes engelmanni* Hopk. The Engelmann spruce weevil was abundant in portions of Glacier National Park in Montana and caused severe stunting of trees.

WHITE-PINE WEEVIL, *Pissodes strobi*. Increased damage by the white-pine weevil occurred in the Northeastern States, in parts of the Lake States, and in local areas in the Southeast. Weevils were particularly abundant in New Hampshire, throughout New York, in parts of Pennsylvania and in northeastern Wisconsin. *P. approximatus* Hopk. was also abundant in portions of the Northeast and the Lake States.

LODGEPOLE TERMINAL WEEVIL, *Pissodes terminalis* Hopk. The lodgepole terminal weevil was abundant in parts of California and terminal shoots on host trees were killed on large areas.

PALES WEEVIL, *Hylobius pales* (Hbst.). The pales weevil was damaging to trees in plantations in Wisconsin, Minnesota, Pennsylvania and New York. A related species, *H. warreni* Wood, was also abundant in Wisconsin, where broods developed in stumps from areas where trees were harvested. *H. radicis* Buch. was serious in Wisconsin, Michigan, Minnesota, New York and Connecticut. Heaviest damage occurred in northern Wisconsin in sandy soils and in a Christmas tree plantation at Shelton, Connecticut.

LOCUST BORER, *Megacyllene robiniae* (Forst.). The locust borer remained important throughout the Central States, particularly in areas where black locust has been planted extensively to reclaim strip-mined lands.

POPLAR BORER, *Saperda calcarata* Say. The poplar borer and others, including *S. concolor* Lec., *Angrilus anxius* Gory, *A. liragus* (B. & B.), *Dicerca tenebrica* (Kby.) and *Glycobius speciosus* (Say), were destructive to host trees in many parts of the Lake States and Central States.

CALIFORNIA FLATHEADED BORER, *Melanophila californica* Van Dyke. Tree-killing by the California flatheaded borer was less severe in 1959 than in previous years and damage of significant proportions was confined largely to southern California. The hemlock borer, *M. fulvoguttata* (Harr.), was reported causing damage in the Lake States.

BUDWORMS AND LEAF ROLLERS

SPRUCE BUDWORM, *Choristoneura fumiferana*. The spruce budworm occurred in outbreak proportions in spruce-fir stands from coast to coast. Infestations spread eastward in Maine and defoliation ranging from light to severe occurred on approximately 940,000 acres. Budworm activity also increased in Minnesota and about a million acres of host type were moderately to severely defoliated. In Montana and north Idaho, nearly 4 million acres were infested and severe defoliation occurred in most of the Douglas-fir timber east of the Continental Divide. In south Idaho, trees were defoliated on a half-million acre area; in Colorado, 350,000 acres were infested; and in New Mexico, infestations more than doubled from prior years, to about 703,000 acres. Severity of infestations and tree damage declined in most parts of Oregon, but 209,000 acres were defoliated.

JACK PINE BUDWORM, *Choristoneura pinus* Free. Defoliation of pine stands in the Lake States in 1959 was much heavier than in prior years, but infestations were not widespread. Some 600 acres in Minnesota were sprayed to reduce epidemic populations and an equal acreage is planned for spraying if density of broods remains high. Other pine-feeding *Choristoneura* spp. caused noticeable defoliation of lodgepole and whitebark pine in eastern Montana and in Wyoming, and in ponderosa pine stands near Helena, Montana.

BLACK-HEADED BUDWORM, *Acleris variana*. Large numbers of black-headed budworm occurred in the hemlock-spruce stands of southeast Alaska. Heaviest populations were in the Cholmondely Sound area and in the vicinity of Kasaan Bay and Portland Canal. Infestations which occurred in Idaho and Washington in 1958 declined and no damage to host trees was noted.

LARGE ASPEN TORTRIX, *Archips conflictana* (Wlkr.). The large aspen tortrix, in combination with *A. argyrospila* (Wlkr.), occurred in outbreak in Essex County, New York. Neither pest was reported from other areas, yet both species are widely distributed.

FIR LEAF-ROLLER, *Argyrotaenia dorsalana* (Dyar). The fir leaf-roller increased in numbers in true fir stands throughout much of eastern Oregon. Defoliation, however, was not severe

NEEDLE MINERS

LODGEPOLE NEEDLE MINER, *Recurvaria milleri*. The lodgepole needle miner continued its outbreak in the high elevation stands of lodge-

pole pine in Yosemite National Park, California. Two additional smaller infestations occurred in the state but neither of them was particularly severe. A new outbreak, covering approximately 104,000 acres, occurred on the Sawtooth and Targhee National Forests in Idaho. An unidentified *Recurvaria* sp. affecting spruce was reported in eastern Oregon, where an upward trend of infestation developed locally.

PINE NEEDLE MINER, *Exoteleia pinifoliella* (Chamb.). The pine needle miner has occurred in portions of Ohio, the higher elevations of Virginia, in Delaware, New Jersey and Massachusetts for the past several years. Populations in 1959 were evident in all these states but damage to host trees was not severe.

PONDEROSA PINE NEEDLE MINER, *Argyresthia* sp. An outbreak of a needle miner in stands of ponderosa pine in southeastern Oregon, first discovered in 1958, increased in intensity and spread to additional areas.

SAWFLIES

Various species of sawflies defoliated coniferous stands and young pine plantations in many parts of the country. In the West, a *Neodiprion* sp. occurred in Douglas-fir southeast of Puyallup, Washington; other species of the same genus defoliated true firs and western hemlock in Washington and Oregon. Six or more species were abundant in the Intermountain States, as follows: A species of *Neodiprion* severely defoliated lodgepole and ponderosa pine in Montana; *N. burkei* Midd. stripped almost all old-growth needles from lodgepole pine on some 5,000 acres in Idaho; *N. abietis* complex appeared in outbreak numbers in the same state; and an unknown species was discovered on lodgepole pine in a 75-square-mile area in Nevada. Two undescribed *Pristiphora* species were reared from western larch in Idaho, and *P. erichsonii* defoliated patches of larch in the vicinity of Missoula, Montana. The latter species, epidemic in the Lake States since 1949, defoliated trees on some 350,000 acres in Minnesota. Infestations also continued in northern Wisconsin and Upper Michigan.

Several of the sawflies affecting pines were particularly abundant in the Eastern States. *N. lecontei* occurred in damaging numbers at several locations in New York, Michigan, Missouri, Ohio, Louisiana and Texas. Isolated infestations were reported from Oklahoma, Arkansas, Alabama and Mississippi. *N. pratti pratti*, in outbreak in Maryland and Virginia since 1954, spread southward into North Carolina and now occurs on over 14 million gross acres. *N. sertifer* (Geoff.) severely defoliated red and Scotch pines in New York, Connecticut, New Jersey, Pennsylvania, and in parts of Ohio. In the latter state, the area of infestation doubled during the year. *N. pinetum* (Nort.) was generally light and scattered, but in Ohio there were instances of pine mortality from severe defoliation. *N. taedae linearis* Ross occurred over most of southeastern Missouri, southern Illinois, southern Arkansas and northern Louisiana. A little-known species, *N. excitans*, was abundant and damaging to loblolly and shortleaf pines in southeast Texas. Populations in one area, 25,000 acres in size, had to be suppressed by artificial means to prevent tree-killing. *N. excitans* also occurred on some 300,000 acres of loblolly pine in Florida. Weather, parasites and predators, however, reduced populations in most of this area. Early summer and autumn feeding by *N. pini-rigidae* (Nort.) was common on pitch pine in southern New Jersey. Small light infestations of *N. americanus banksianae* Roh., *N. swainei* Midd. and *N. nanulus* Schedl. were reported in the Lake States. In Alaska, the hemlock sawfly, *N. tsugae*, occurred in much of the area infested by black-headed budworm.

LOOPERS, TUSSOCK MOTHS, TENT CATERPILLARS, AND OTHER DEFOLIATORS

SPEAR-MARKED BLACK MOTH, *Eulype hastata*. The spearmarked black moth defoliated considerably less forest in Alaska during 1959 than in the widespread epidemic of 1958. Light feeding occurred only in limited areas along the Alaska Highway between Tok and Delta Junctions.

NEW MEXICO FIR LOOPER, *Galenara consimilis* Hein. A recurrence of New Mexico fir looper in outbreak, the first since 1952, occurred on approximately 1,500 acres on the Lincoln National Forest in New Mexico.

ELM SPANWORM, *Ennomos subsignarius*. The elm spanworm has long been a pest of hardwoods in the Southeastern States. An outbreak, beginning in 1954, still persists in the mountains of Georgia, Tennessee and North Carolina. An area of infestation, now covering more than a million acres, increased in 1959 but intensity of defoliation was markedly lower.

DOUGLAS-FIR TUSSOCK MOTH, *Hemerocampa pseudotsugata*. The Douglas-fir tussock moth occurred in large numbers on some 5,000 acres of white fir on the east side of the Snake Mountains in Nevada. Several other outbreaks of the same species, or a closely related one, were also reported during the year. In the vicinity of Carson City, Nevada, an outbreak occurred on bitterbrush, a browse plant; another, on some 10,000 acres of shrubs, occurred near Idaho City, Idaho. On the Targhee National Forest in Idaho, an infestation was found on dwarf mistletoe on lodgepole pine. In New Mexico and Arizona, severe outbreaks occurred at four separate locations. The insect was common in eastern Oregon.

FOREST TENT CATERPILLAR, *Malacosoma disstria*. The forest tent caterpillar stripped large areas of bottomland hardwoods in Louisiana, Alabama, and parts of Mississippi. Defoliation was also severe along the West Virginia-Virginia state line, and in parts of Maryland and Pennsylvania. The large populations of 1958 in Minnesota and Wisconsin dwindled considerably.

EASTERN TENT CATERPILLAR, *Malacosoma americanum* F. The eastern tent caterpillar caused moderate to complete defoliation of many host trees in several states. Infestations were particularly severe in eastern Ohio and in Delaware, Maryland, Rhode Island and New York.

GREAT BASIN TENT CATERPILLAR, *Malacosoma fragile* (Stretch). The Great Basin tent caterpillar was abundant at several places in the Western States. In California, woody browse plants were severely defoliated on large areas; in New Mexico, Arizona, and Colorado, infestations continued in high elevation aspen stands but populations were drastically reduced by natural factors in some areas. Epidemic populations were reported from Humboldt County, Nevada.

WESTERN TENT CATERPILLAR, *Malacosoma pluviale* (Dyar). The western tent caterpillar was prevalent on red alder in western Oregon and Washington. Defoliation, however, was less severe than during previous years.

PANDORA MOTH, *Coloradia pandora*. Outbreaks of pandora moth occurred at several locations in the Western States. In California, light infestations were observed in San Diego County; in the Uinta Mountains of Utah, 15,000 acres of lodgepole pine forest were defoliated; some 9,000 acres were infested on the Medicine Bow and Routt National Forests near the Wyoming-Colorado boundary. Last year's outbreak in eastern Oregon was controlled by predators and parasites.

PINE BUTTERFLY, *Neophasia menapia* (F. & F.). The white pine butterfly often erupts in epidemic numbers and is destructive to stands of ponderosa pine in the Western States. The butterfly was numerous in northern Idaho and western Montana in 1959 but no severely defoliated areas were found.

LARCH CASEBEARER, *Coleophora laricella*. The larch casebearer, usually a pest in the Northeast, recently has been found in Idaho, Montana, and northeastern Washington. In 1959, infestations spread in those states to a gross area of 8,000 square miles. Severe defoliation, however, was confined to approximately 20,000 acres, mostly in Idaho.

GYPSY MOTH, *Porthetria dispar* (L.). Winter and spring weather in the Northeast favored development of the gypsy moth and a build-

up of populations occurred in scattered centers in New England and eastern New York. Localized infestations were found in Michigan, and male moths were trapped at locations west and southwest of Lansing. Spraying to eliminate infestations was continued in Michigan and in New York.

Pine shoot and tip moths

European pine shoot moth, *Rhyacionia buoliana*. The European pine shoot moth caused great damage to young red pine plantations and more limited damage to other pine species at several localities in the Central States, Lake States, and in the western two thirds of the Northeastern States. The shoot moth also was found for the first time in the Pacific Coast States on ornamental red pine, near Seattle, Washington.

Nantucket pine moth, *Rhyacionia frustrana*. Twig-killing of pines by the Nantucket pine moth and a related species, *R. rigidana* (Fern.), was quite abundant in the Northern Plains, in most of the Central States, in the South and Southeast, and along the eastern shore of Maryland. Loblolly and shortleaf pines were most frequently infested in all areas. An undetermined *Rhyacionia* sp. has persisted for many years in damaging numbers on a portion of the Custer National Forest in Montana.

Zimmerman pine moth, *Dioryctria zimmermani* (Grote). The Zimmerman pine moth continued to be an important pest of young pines in Michigan, Wisconsin and Indiana. It was also active in northeastern Illinois. Another shoot moth, *Eucosma gloriola* Hein., was abundant and damaging to red, white, Scotch and Austrian pines in several counties in Pennsylvania.

Sucking insects

Balsam woolly aphid, *Chermes piceae*. The balsam woolly aphid occurred in damaging numbers in Oregon, Washington, North Carolina and in the Northeast. Aphid populations increased and killed many additional trees in the Pacific Northwest. One new infestation center of light intensity also developed in subalpine fir on the Yakima Indian Reservation, marking the easternmost known range of the insect in Washington. Killing of Fraser fir in North Carolina increased and was of particular concern because of the important scenic and recreational areas involved. In the Northeast, particularly in Vermont, New Hampshire, New York and Maine, nearly three quarters of the balsam fir stands were infested and tree mortality is becoming more severe. Efforts to suppress aphid populations were increased in all areas by liberating insect predators from abroad.

Cooley spruce aphid, *Chermes cooleyi* Gill. The Cooley spruce aphid occurred in large numbers on ornamental spruce, Engelmann spruce and Douglas-fir throughout Montana, northern Idaho and in New York. All infestations caused severe yellowing of needles, but none caused tree mortality or an appreciable killing of twigs and branches.

Spruce mealybug, *Puto* sp. A spruce mealybug, in outbreak in high-elevation stands of Engelmann spruce in southern Utah for the past several years, remained active in 1959. It is now prevalent on some 60,000 acres at three separate locations. A fir aphid, *Cinara* sp., was unusually abundant in stands of grand fir in northern Idaho and in parts of the Kootenai National Forest in Montana. The woolly pine aphid, *Pineus pinifoliae* (Fitch), killed and damaged some trees on the Superior National Forest in Minnesota and in Virginia but was not widespread in either state. The eastern spruce gall aphid, *Chermes abietis* L., also caused light damage to white spruce and Norway spruce in local areas in Minnesota, New York, Pennsylvania, Maryland and Maine. *Aphis abietina* Wlk. caused light to moderate defoliation to spruce in the coastal forests of Oregon.

Black pine leaf scale, *Nuculaspis californica*. The black pine leaf scale developed outbreak in stands of sugar pine at several locations in California. In each location, in the north coast subregion and in the central part

of the state, infestations occurred on several hundred to several thousand acres.

Pine tortoise scale, *Toumeyella numismaticum* (P. & M.). The pine tortoise scale was reported as damaging at several locations in the Lake States. Populations, however, were held in check by natural controls.

Beech scale, *Cryptococcus fagi* (Baer.). A general outbreak of beech scale occurred in the Hudson River Valley and near Warrensburg, New York, and in parts of New Hampshire.

Spider mites

Spruce spider mite, *Oligonychus ununguis* (Jac.). The scope and severity of spruce spider mite infestations in Montana and northern Idaho lessened but damaged trees at scattered locations in both states. Evidence of the large-scale outbreaks of prior years in these areas, however, was clearly visible. *O. milleri* infested about 10 million acres of loblolly and shortleaf pines in northern Louisiana and in southern Arkansas. Young, open-grown or understocked even-aged stands were hardest hit, but both large and small trees were infested in some areas.

Cone and seed insects

Insects attacking cones and seeds of forest trees were damaging in several sections of the country. . In California, *Conophthorus lambertianae* Hopk. destroyed almost all of the sugar pine cones, and other *Conophthorus* spp. severely damaged ponderosa and Jeffrey pine cones. Damage to the Douglas-fir seed crop by *Dioryctria abietella* (D. & S.) and *Barbara colfaxiana* Kearf. was spotty. It was light in the western portion of the Douglas-fir region in California and in Oregon, but heavier damage occurred in eastern California. Cone moths, mostly *Dioryctria* spp., were damaging to pine in the Western States; the South and Southeast; and to a limited degree in the Northeast.

Miscellaneous insects

Allegheny mound ant, *Formica exsectoides* Forel. The Allegheny mound ant was damaging to young white pines in several counties in Ohio, where as many as 10 mounds per acre killed trees in groups of 5 to 20. The ants destroyed the trees around each mound for a distance of 20 feet or more by injecting formic acid into the tissues of the main stem.

Texas leaf-cutting ant, *Atta texana* Buckley. The Texas leaf-cutting ant caused mortality to young pines in several areas in west-central Louisiana and in eastern Texas. The damage was done during the winter months, when pines provided the only green foliage available.

Pine leaf chafer, *Pachystethus oblivia* (Horn.). During the spring, the pine leaf chafer caused needle-browning on some 5,000 acres of young loblolly pines in southeastern North Carolina. Feeding was confined to new growth and injury consisted of a notch cut in each needle just above the bundle sheath. The needles bent down at this point and died, giving the trees a brownish appearance.

Birch leaf miner, *Fenusa pusilla* (Lep.). The birch leaf miner was widespread in outbreak numbers in the Northeast. Defoliation of trees was complete in some areas in New York and severe in portions of Vermont, Massachusetts and New Jersey.

Saratoga spittlebug, *Aphrophora saratogensis* (Fitch.). The Saratoga spittlebug occurred in damaging numbers in several areas in Wisconsin and Michigan. The pine spittlebug, *A. parallela* (Say), was also reported as abundant in the Lake States.

Fall webworm, *Hyphantria cunea* (Drury). The fall webworn was common in several of the Eastern and Central States and west of the Cascade Range in Oregon and Washington. The mimosa webworm, *Homadaula albizziae* Clarke, was also common throughout southern Indiana, central and southern Kentucky, and southwestern Ohio.

OUTBREAKS AND NEW RECORDS

INDIA

G.A. Gangrade, College of Agriculture, Jabalpur, Madhya Pradesh

Chloriona furcifera on rice in Madhya Pradesh

During September and October 1958, rice in Madhya Pradesh was reported to be damaged by a small insect, which was identified as *Chloriona* (*Sogatella*) *furcifera* Horvath (= *Sogata pallescens* Dist.)[1] by the Commonwealth Institute of Entomology. In that year, the insect was limited to Jabalpur district but the infestation was severe. In 1959, it was found to spread to Raipur and Bilaspur districts. It appears that in this area the insect has become established as one of the major rice pests.

Field surveys carried out during the past two years showed that the insect was prevalent on rice from August to October and as many as 20 to 25 nymphs and adults were observed on a single plant. Both nymphs and adults were most active in the morning and evening, whereas under hot sun in the afternoon they hid under leaves in fields where the crop was thick and water level high.

As a result of their feeding, the affected rice plants appeared pale and stunted. In severe infestations, the tips of rice leaves might turn brick red.

[1] The identification is regarded as tentative because the material available consisted only of females.

ITALY

Francesco Boselli, Osservatorio Fitopatologico, Cagliari, and

Antonio Ciccarone, Istituto di Patologia Vegetale dell'Università, Bari

Occurrence of bacterial canker of tomato in Sardinia

A serious outbreak of bacterial canker of tomato caused by *Corynebacterium michiganense* (E.F. Sm.) Jensen occurred in Sardinia during the spring of 1960. The disease spread rapidly in early tomato plantings and also caused serious damage to the Marmande variety grown under glass. The pathogen was isolated and the disease reproduced on healthy plants through inoculation.

During the past years, bacterial canker has caused extremely heavy losses in the Po Valley, into which area tomato seed has been repeatedly imported from North America. This disease was not previously known to occur in Sardinia and this constitutes the first record of its presence on the island.

PLANT QUARANTINE ANNOUNCEMENTS

NETHERLANDS

Order No. J 675 of 28 April 1960, published in the *Nederlandse Staatscourant* No. 82 on the same date, replaces Order No. J 2391 of 12 September 1958 (see *FAO Plant Prot. Bull.* 7 : 31, 1958) concerning the importation of tulip and narcissus bulbs. The new Order, which will come into force on 1 April 1961, provides that the importation of tulip and narcissus bulbs is permitted only if the following requirements are fulfilled.

1. The consignment must be free from infestation by the stem and bulb eelworm (*Ditylenchus dipsaci*).
2. If infestation by the stem and bulb eelworm has been recorded in the country of origin, the plants from which the bulbs were derived must have been officially examined during growth and found to be free from infestation.
3. The consignment of bulbs must be accompanied by a phytosanitary certificate issued by the country of origin in the form annexed to the International Plant Protection Convention of 1951.
4. If the exporting country is not the country where the bulbs were grown, the consignment must be accompanied, in addition to the phytosanitary certificate of the country of origin or an authenticated photocopy thereof, by a declaration by the plant protection service of the exporting country to the effect that the consignment is still considered to conform with the phytosanitary requirements of the Netherlands.

REPUBLIC OF SENEGAL *(continued from Vol. 8, No. 12, Sept. 1960)*

Specific requirements

Roses (*Rosa* spp.)

Vegetative material for multiplication from Southeast Asia, East Asia and Pacific Islands - prohibited; from other countries - import permit and certificate with declaration that rose streak virus and rose wilt virus do not occur in the region of origin.

Seed and cut flowers - certificate.

Rubber (*Hevea* spp.)

Dead parts and dried specimens - prohibited.

Vegetative material and seed from African countries South of the Sahara - import permit and certificate; from other countries - imports only by Plant Protection Service, and requiring quarantine first at a station outside Africa where *Dothidella ulei* does not occur and again at a station in Africa South of the Sahara.

Sisal (*Agave* spp., *Fourcroya* spp.)

Vegetative material (except bulbils) - imports only by Plant Protection Service, and requiring certificate and quarantine.

Bulbils - import permit, certificate with declaration on growing season inspection indicating freedom from pests and diseases, and treatment on arrival.

Seed - certificate.

Commercial shipments of fibers - unrestricted.

Soil and composts

Soil and compost for rooting, packing or any other use (except that mentioned below) - prohibited.

Soil and compost for scientific purposes or analysis - import permit.

Special composts such as sphagnum and peat - certificate with declaration that it has been sterilized before shipment.

Soybean (*Glycine soja*)

Vegetative material - prohibited.

Seed - import permit and certificate with additional declarations that cyst-forming nematodes are not known in the region of origin, and that the plants and the

field were found in the growing season free from *Corynebacterium flaccumfaciens* or that this pathogene does not exist in the region of origin.

Commercial shipments of dry beans - inspection on arrival, and treatment if necessary.

Strawberry (*Fragaria* spp.)

Vegetative material from Southeast Asia, East Asia and Pacific Islands - prohibited; from other countries - import permit and certificate with declaration indicating that by growing season inspection the plants were found free from *Phytophthora fragariae* and viruses.

Seed - certificate.

Fresh fruit from Southeast Asia, East Asia, Pacific Islands and any other country where *Dacus dorsalis* occurs - prohibited; from other countries - certificate with declaration that *D. dorsalis* is not known in the country of origin, and inspection on arrival.

Sugar cane (*Saccharum* spp.)

Vegetative material from African countries South of the Sahara (except Madagascar) - import permit and certificate with declaration indicating that by growing season inspection plants were found free from virus and bacterial diseases; from other countries - imports only by Plant Protection Service, and requiring certificate with declaration as mentioned above and quarantine.

Seed from African countries South of the Sahara (except Madagascar) - import permit, certificate; from other countries - imports only by Plant Protection Service, and requiring certificate and inspection on arrival.

Commercial shipments of cane - prohibited.

Sweet potatoes (*Ipomea batatas* and other spp.)

Vegetative material for multiplication - imports only by Plant Protection Service, and requiring certificate with declarations that cork virus disease does not occur in the country of origin and that the plants were inspected during growth and found free from virus diseases. Quarantine and freedom from soil also required.

Tubers for consumption (without soil) from African countries South of the Sahara - certificate; from other countries - prohibited.

Seed - certificate and inspection on arrival, and treatment if necessary.

Tea (*Thea sinensis* and other spp.)

Vegetative material and seed from African countries South of the Sahara - imports only by Plant Protection Service, and requiring certificate with declaration stating that *Exobasidium vexans* does not occur in the country of origin; from other countries - prohibited.

Commercial shipments - unrestricted.

Timber

Timber with bark - prohibited.

Timber without bark (logs, wood peelings, sawed timber) - methyl bromide fumigation if necessary.

Tobacco (*Nicotiana* spp.)

Vegetative material - prohibited.

Seed from countries where *Colletotrichum tabacum* or *Peronospora tabacina* occurs - prohibited; from other countries - import permit and certificate with declarations stating that *C. tabacum, P. tabacina* and *Pseudomonas tabaci* do not occur in the country of origin and that the plants were inspected during growth and found free from all diseases, and that the seed was treated with 0.1 percent silver nitrate.

Tomatoes (*Solanum lycopersicum* and related species)

Vegetative material - prohibited.

Seed - certificate with declarations that the field of origin is free from *Corynebacterium michiganense* and that the parent plants were inspected during growth and found free from all bacterial and virus diseases.

Water hyacinth (*Eichornia crassipes*)

Vegetative material and seed - prohibited.

Wild plants or plants not specifically mentioned.

Vegetative material and seed - import permit and certificate with additional declaration.

Yam (*Dioscorea* spp.)

Vegetative material - import permit, and certificate with declaration indicating freedom from all diseases during growth.

Seed - certificate.

Commercial shipments - inspection on arrival, and fumigation if necessary.

SPAIN

Resolution of the Ministry of Agriculture of 8 April 1960, published in the *Boletín Oficial del Estado*, Vol. 25, No. 95 dated 20 April 1960, supplements the Order of 14 March 1953 (see *FAO Plant Prot. Bull.* 1 : 141, 1953) which prohibits importation of living plants, parts thereof, fruits and seeds from countries infested or infected with citrus black fly (*Aleurocanthus woglumi*), Mexican fruit fly (*Anastrepha ludens*), Oriental fruit fly (*Dacus dorsalis*), melon fly (*D. cucurbitae*), tristeza of citrus, Pierce's disease of grapevine, and black spot of citrus (*Phoma citricarpa*).

The new Resolution provides that all countries in America, Africa, Asia, Australia and the Mediterranean Basin will be considered as infested or infected by pests and diseases mentioned above and may therefore not export to Spain living plants, parts thereof, fruits and seeds.

Any consignment containing citrus (plants, branches, scions, roots, leaves, fruit, seed or wood) will be destroyed or returned to the country of origin.

Living parts of citrus for scientific purposes may only be imported under a special permit issued in advance by the Ministry of Agriculture.

VIET-NAM

Decree No. 182 - BCN-ND-KH-1-A of 13 June 1960, published in *Cong-Bao Viet-Nam Cong-Hoa*, Vol. 6, No. 32 on 9 July 1960, establishes measures governing the importation of cacao propagation material.

Importation of cacao seedlings, pods or seeds for planting is permitted only from countries not known to be infested by *Sahlbergella singularis*, *Distantiella theobroma*, *Helopeltis bergrothi*, *Marasmius perniciosus*, *Monilia roreri*, *Trachysphaera fructigena*, and especially virus diseases. Imports are subject to inspection by the Bureau of Phytosanitary Inspection and will be rejected or destroyed if they do not meet the phytosanitary requirements.

Importation of those materials is strictly prohibited from Africa (especially Ivory Coast, Ghana, Dahomey, Nigeria, the Cameroons and the Congo), Ceylon, the West Indies, Central America and South America.

NEWS AND NOTES

FINLAND ADHERES TO INTERNATIONAL PLANT PROTECTION CONVENTION

The Government of the Republic of Finland became party to the International Plant Protection Convention on 22 June 1960, when its instrument of adherence was received by the Director-General of FAO. The number of governments contracting to the Convention, including both signatory and adhering members, is thus at the time of writing 41, namely: Argentina, Australia, Austria, Belgium, Cambodia, Canada, Ceylon, Chile, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Federal Republic of Germany, Finland, France, Greece, Guatemala, Hungary, India, Iraq, Ireland, Israel, Italy, Japan, Korea, Laos, Luxembourg, the Netherlands, New Zealand, Nicaragua, Norway, Pakistan, Republic of the Philippines, Portugal, Spain, Sweden, the Union of South Africa, the Union of Soviet Socialist Republics, the United Kingdom and Yugoslavia.

BLUE MOLD OF TOBACCO IN EUROPE

Blue mold of tobacco (*Peronospera tabacina*) is a very destructive disease in Australia and North and South America. It first appeared in Europe in 1958 and is rapidly spreading, threatening the future of tobacco cultivation in this continent. The estimated losses caused by this disease in 1960 in some European countries are summarized in Table 1.

To deal with this serious new problem, the Co-operation Center for Scientific Research Relative to Tobacco (CORESTA) has organized a working party under the chairmanship of Dr. R. Huter of Switzerland. A meeting was held in Lausanne, 5-6 October 1960, which concluded that effective control of the disease can be achieved only through collaboration of national plant protection services of all interested countries in Europe. In addition to the emphasis on the need for periodic inspection, exchange of information and efficient organization, the working party proposed that all countries concerned should enact, provisionally for one year, the following regulations.

TABLE 1. Losses caused by tobacco blue mold (*Peronospera tabacina*) in Europe in 1960[1]

Country	Losses		
	in percentage of harvest	in metric tons	in monetary value (thousand Swiss francs)
Austria	25	200	500
Belgium	65	2 700	5 000
Germany, Federal Republic	60	6 000	40 000
France	67	10 000	45 000
Germany, Democratic Republic	30	1 700	12 000
Italy	5	4 000	8 000
Switzerland	10	250	1 500

[1]Data supplied by CORESTA.

1. The growing of any species of *Nicotiana* in any place, including scientific institutes, is to be prohibited from 1 December until a date established by the competent national authorities, coinciding with the beginning of the normal tobacco-growing season in the area. On 1 December, all tobacco plants must have been burned or plowed under.

2. Institutes may be authorized to grow specific species of *Nicotiana* under special supervision. Plants grown under such authorization, if found infected with blue mold, must be immediately destroyed and reported to the authority which issued the authorization.

3. Investigation on blue mold is prohibited from 1 December until the reappearance of the disease in the area has been officially ascertained. Investigations may be reassumed only when permission has been obtained from the authorities.

4. Prophylactic measures to be taken by tobacco planters should be officially decreed.

In order to assist the national services to apply effective and standardized procedures, the working party made various observations and recommendations with regard to the prophylactic and control measures to be taken in the seed bed as well as in the field. As it was demonstrated in Eastern Germany that diseased tobacco samples, after being dried for four days at 80°C. and fermented at 35°C. and 50 to 60 percent air humidity were still found to contain live inoculum, the working party considered it necessary to burn all the tobacco waste and to avoid mixing such waste with manure or compost.

SYMPOSIUM ON WEAVER BIRDS IN AFRICA

A symposium on grain-eating weaver birds (*Quelea*), organized jointly by the Commission for Technical Co-operation in Africa South of the Sahara (CCTA) and FAO, was held in Bamako, Soudanese Republic, from 17 to 21 May 1960. It was attended by delegates from Chad, the Federation of Rhodesia and Nyasaland, France, Mauritania, Niger, Nigeria, Portugal, Soudan, Senegal, the Union of South Africa and the United Kingdom. Previous symposiums on this subject were held in Dakar, Senegal, in 1955, and in Livingstone, Southern Rhodesia, in 1957.

The main items discussed at the symposium included the co-ordination of research and control on an interregional and interterritorial level, the review of the progress achieved in *Quelea* control, and the control of birds other than *Quelea*, which also constitute a menace to crops.

The establishment of a joint bird control organization, *Organisation commune de lutte anti-aviaire* (OCLAV), by the Governments of Mauritania and Niger, Senegal and Soudan was commended, and the symposium expressed the hope that other countries will also join OCLAV, so that it may become a centralized agency responsible for the circulation of all the information relating to weaver birds in West Africa.

In order to have a better understanding of the migration habits of weaver birds, it was recommended that the current research program should give special attention to bird banding, to an extent of 100,000 rings per year over a period of three years. In addition, research on the physiology, behavior and diseases of weaver birds should be encouraged.

Among the control methods, spraying the roots with parathion is widely used and has given general satisfactory results. It was suggested that a survey of the diseases of weaver birds caused by tryponosomes and plasmodia and their vectors be carried out, with a view to determine the possibility of their application in bird control.

The following bird species other than *Quelea* were reported causing serious crop losses :

Spur-winged goose (*Plectopterus gambiensis*)
Egyptian goose (*Alopochen aegyptiaca*)
Knob-billed goose (*Sarkidiornis melanotos*)
Whistling teal (*Dendrocygna viduata*)
Fulvous duck (*Dendrocygna bicolor*)
Black-tailed godwit (*Limosa limosa*)

TIPOGRAFIA F. FAILLI - ROMA

GRASS COVER OF AFRICA

FAO Agricultural Studies No. 49

This important work is actually a summary in map form of the extent of present knowledge of the grass cover of Africa which can be used as a guide not only in the field of range or grassland management, but also in the wider reaches of land use generally. Included with 143 pages of text is a six-color 1 : 10,000,000 map in separate folder of Africa's grass cover as compiled from discussions and correspondence with a great number of specialists in Africa and elsewhere.

Textually, the study deals with ecological relationships of Africa's grass cover and types of vegetation with which such cover is associated. Twenty-three genera used to distinguish the various associations are also discussed, as well as types of the grass cover itself. There are a number of appendixes, including an index of African grass cover types and their geographical distribution.

Publication of this study has resulted from a decision by FAO to map the grass cover of Africa first, and then to use the experience and technique so gained to prepare maps of other parts of the world. It represents a first step forward toward the long-term objective of mapping the grazing resources of the world's underdeveloped countries on some basis of value to those concerned with the improvement of grassland management and the livestock industries dependent on them.

Available at FAO, Rome, Italy, or from local sales agents in English, French and Spanish editions.

$2.50 or 12s. 6d.

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